

AMENDMENTS TO THE CLAIMS

1. (Withdrawn) A ball screw apparatus comprising:

a screw shaft including a spiral-shaped screw groove formed in an outer peripheral surface thereof;

a nut movably fitted with the screw shaft and including a screw groove formed in an inner peripheral surface thereof so as to correspond to the screw groove of the screw shaft;

a plurality of balls rollably disposed in a raceway formed between the two screw grooves;
and

at least one side cap mounted on a circumferential outer surface of the nut and including a ball circulation passage for scooping up the balls rolling along the raceway in a direction coincident with the lead angle of the two screw grooves and returning the balls to the raceway,

wherein the side cap is divided into two members along the ball circulation passage,

wherein the side cap further comprises a pair of ball scooping up portions and a cap main body, which are continuous with each other so as not to form step portions, and

wherein the two screw grooves are respectively formed as multiple thread screws and one of the side caps is disposed on each of the multiple threads.

2. (Withdrawn) A ball screw apparatus comprising:

a screw shaft including a spiral-shaped screw groove formed in an outer peripheral surface thereof;

a nut movably fitted with the screw shaft and including a screw groove formed in an inner peripheral surface thereof so as to correspond to the screw groove of the screw shaft, the nut comprising an axial end surface and a cylindrical outer circumferential surface extending perpendicular to the axial end surface;

a plurality of balls rollably disposed in a raceway formed between the two screw grooves;
and ,

at least one side cap mounted on the cylindrical outer circumferential surface of the nut and including a ball circulation passage for scooping up the balls rolling along the raceway in a

direction coincident with the lead angle of the two screw grooves and returning the balls to the raceway,

wherein the nut includes a plurality of ball circulation circuits each formed by the raceway and the ball circulation passage;

the side cap is divided into two members along the ball circulation passage, and

the side cap further comprising a pair of ball scooping up portions and a cap main body, which are continuous with each other so as not to form step portions.

3. (Withdrawn) A ball screw apparatus as set forth in Claim 2, wherein the circulation movements of the balls in the plurality of ball circulation circuits are carried out by a single side cap.

4. (Withdrawn) A ball screw apparatus as set forth in Claim 2, wherein the circulation movements of the balls in the plurality of ball circulation circuits are carried out by the side caps respectively disposed on associated ball circulation circuits.

5. (Withdrawn) A ball screw apparatus as set forth in Claim 4, wherein a relief portion for prevention of mutual interference between the two side caps is disposed between the mutually adjoining side caps.

6. (Withdrawn) A ball screw apparatus as set forth in Claim 2, wherein a plurality of circulation holes are formed in the outer peripheral portion of the nut in communication with the raceway in order to fit the side cap into the nut, and the plurality of circulation holes are disposed so as to be prevented from interfere with each other.

7. (Withdrawn) A ball screw apparatus as set forth in Claim 3, wherein a plurality of circulation holes are formed in the outer peripheral portion of the nut in communication with the raceway in order to fit the side cap into the nut, and the plurality of circulation holes are disposed so as to be prevented from interfere with each other.

8. (Withdrawn) A ball screw apparatus as set forth in Claim 4, wherein a plurality of circulation holes are formed in the outer peripheral portion of the nut in communication with the raceway in order to fit the side cap into the nut, and the plurality of circulation holes are disposed so as to be prevented from interfere with each other.

9. (Withdrawn) A ball screw apparatus as set forth in Claim 5, wherein a plurality of circulation holes are formed in the outer peripheral portion of the nut in communication with the raceway in order to fit the side cap into the nut, and the plurality of circulation holes are disposed so as to be prevented from interfere with each other.

10. (Withdrawn) A ball screw apparatus as set forth in Claim 6, wherein the circulation holes are disposed outwardly in the diameter direction of the nut with respect to the center axial line of the nut.

11. (Withdrawn) A ball screw apparatus as set forth in Claim 7, wherein the circulation holes are disposed outwardly in the diameter direction of the nut with respect to the center axial line of the nut.

12. (Withdrawn) A ball screw apparatus as set forth in Claim 8, wherein the circulation holes are disposed outwardly in the diameter direction of the nut with respect to the center axial line of the nut.

13. (Withdrawn) A ball screw apparatus as set forth in Claim 9, wherein the circulation holes are disposed outwardly in the diameter direction of the nut with respect to the center axial line of the nut.

14. (Withdrawn) A ball screw apparatus comprising:

a screw shaft including a spiral-shaped screw groove formed in an outer peripheral surface;

a nut movably fitted with the screw shaft and including a screw groove formed in an inner peripheral surface so as to correspond to the screw groove of the screw shaft;

a large number of balls rollably disposed in a raceway formed between the two screw grooves,

a side cap mounted on the outer peripheral portion of the nut and including a ball circulation passage for scooping up the balls rolling along the raceway in a direction coincident with the lead angle of the two screw grooves and returning the balls to the ~~loaded~~ raceway,

wherein a plurality of the nuts are connected together in the axial direction thereof.

15. (Currently Amended) A ball screw apparatus, comprising:

a screw shaft including a spiral-shaped screw groove formed in an outer peripheral surface thereof;

a nut movably fitted with the screw shaft and including a screw groove formed in an inner peripheral surface thereof so as to correspond to the screw groove of the screw shaft;

a plurality of balls rollably disposed in a raceway formed between the two screw grooves;
and

at least one side cap mounted on a circumferential outer surface of the nut and including a ball circulation passage substantially extending in a longitudinal direction of the screw shaft and a ball scooping up portion for scooping up the balls rolling along the raceway in a direction coincident with the lead angle of the two screw grooves and returning the balls to the raceway;

wherein the two screw grooves are respectively formed as multiple thread screws and one of the side caps is disposed on each of the multiple threads;

wherein an attachment direction of the end cap is perpendicular to a longitudinal direction of the screw shaft,

wherein an attachment hole for the side cap is formed on the circumferential surface of the nut, and the side cap is attached to the attachment hole.

16. (Withdrawn) A ball screw apparatus as set forth in Claim 15, wherein the side cap is divided into two members along the ball circulation passage.

17. (Previously Presented) A ball screw apparatus as set forth in Claim 15, wherein the side cap further comprises a pair of ball scooping up portions and a cap main body, which are continuous with each other so as not to form step portions.

18. (Previously Presented) A ball screw apparatus as set forth in Claim 15, wherein the nut further comprises an axial end surface, and the circumferential outer surface is a cylindrical surface extending perpendicular to the axial end surface.

19. (Withdrawn) A ball screw apparatus as set forth in Claim 1, wherein the nut further comprises an axial end surface, and the circumferential outer surface is a cylindrical surface extending perpendicular to the axial end surface.